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प्रकाशिकी और प्रकाशिक उपकरण — पर्यावरणीय परीक्षण पद्धतियाँ — संयुक्त निम्न ताप और परिवेश ताप या शुष्क ऊष्मा

Indian Standard

OPTICS AND OPTICAL INSTRUMENTS — ENVIRONMENTAL TEST METHODS — COMBINED LOW PRESSURE AND AMBIENT TEMPERATURE OR DRY HEAT

ICS 37.020

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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Price Group 2

Optical and Mathematical Instruments Sectional Committee, ME 31

NATIONAL FOREWORD

This Indian Standard which is identical with ISO 9022-21 : 1998 'Optics and optical instruments — Environmental test methods: Part 21 Combined low pressure and ambient temperature or dry heat' issued by the International Organization for Standardization (ISO) was adopted by the Bureau of Indian Standards on the recommendations of the Optical and Mathematical Instruments Sectional Committee and approval of the Mechanical Engineering Division Council.

This is one in the series of standards relating to testing of optics and optical instruments. This standard was prepared to test the ability of optical instruments and instruments containing optical components under equivalent conditions to resist and to the extent the performance characteristics are affected by combined low pressure and ambient temperature on dry heat.

There is another series of Indian Standards on Procedure for basic climatic and durability test for optical instruments [IS 10236 (Parts 1 to 18)].

The text of ISO Standard has been approved as suitable for publication as Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words 'International Standard' appear (referring to this standard, they should be read as 'Indian Standard'.

b) Comma (,) has been used as a decimal marker while in Indian Standards the current practice is to use a point (.) as the decimal marker.

In this standard, reference appears to certain International Standards for which Indian Standards also exist. The corresponding Indian Standards which are to be substituted in their place are listed below along with the degree of equivalence for the editions indicated:

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
ISO 9022-1:1994	IS 10236 (Part 1) :1989 Procedure for basic climatic and durability tests for optical instruments: Part 1 General	Technically equivalent
ISO 9022-2:1994	IS 10236 (Parts 2 to 5) : 1982 Procedure for basic climatic and durability tests for optical instruments: Part 2 Dry heat test Part 3 Cold test Part 4 Damp heat test Part 5 Damp heat (cyclic) test	do

Indian Standard

OPTICS AND OPTICAL INSTRUMENTS — ENVIRONMENTAL TEST METHODS — COMBINED LOW PRESSURE AND AMBIENT TEMPERATURE OR DRY HEAT

1 Scope

This part of ISO 9022 specifies methods for the testing of optical instruments and instruments containing optical components, under equivalent conditions, for their ability to resist combined low pressure and ambient temperature or dry heat.

The purpose of the testing is to investigate to what extent optical, thermal, mechanical, chemical and electrical performance characteristics of the specimen are affected by combined low pressure and ambient temperature or dry heat; examples are instruments which are installed or transported inside aircraft or flying objects not providing any pressure equalization.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 9022. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 9022 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 9022-1:1994, *Optics and optical instruments — Environmental test methods — Part 1: Definitions, extent of testing.*

ISO 9022-2:1994, *Optics and optical instruments — Environmental test methods — Part 2: Cold, heat, humidity.*

3 General information and test conditions

Ambient temperature as understood by this part of ISO 9022 is (23 ± 3) °C.

The values of temperature specified in table 2 are selected from ISO 9022-2, conditioning method 11.

Conditioning uses air circulation in low-pressure cabinets or low-pressure chambers. The low-pressure chamber can itself either be equipped as a thermal chamber or be installed in a thermal chamber. The size of the test chamber and the setup of the specimens shall be chosen in such a way that a uniform temperature for all specimens within the test chamber is ensured.

If heating is required to achieve the test temperature, heating shall be started before the pressure is reduced. The test temperature shall have been reached before the test pressure is set at the very latest.

When the pressure is rising, no condensation shall occur on the specimen; this can be achieved by using repurified nitrogen or dry air for the ventilation of the test chamber.

Temperature changes shall be brought about so slowly as to prevent any damage to the specimen. When the pressure is changed, abrupt changes are to be avoided in so far as they do not correspond to natural conditions.

The period of conditioning shall start when all parts of the specimen have adjusted to the temperature of the test chamber to within 3 K and the pressure required has been reached. Thermally active specimens shall be subjected to the test temperature until the temperature of the specimen changes by no more than 1 K per hour during constant test chamber temperature. After this, the reduction in pressure shall be started. Intrinsic heating of the specimen during this procedure shall be admissible. The period of conditioning shall start as soon as the test pressure required has been reached. After completion of conditioning, the rise in pressure is initiated and the test chamber starts cooling down. The temperature shall be measured in the test chamber and on the specimen. The location of the temperature measurement on the specimen shall be stipulated in the relevant specification.

With conditioning method 45, the thermally active specimen — unless the relevant specification stipulates otherwise — shall be put into operation after the test pressure has been reached. These specimens shall be subjected to the test pressure until the temperature of the specimen increases by no more than 1 K within one hour (steady-state temperature).

4 Conditioning

4.1 Conditioning method 45: combined low pressure and ambient temperature

See table 1.

Table 1 — Degrees of severity for conditioning method 45: Combined low pressure and ambient temperature

Degree of severity		01	02	03	04
Temperature of test chamber	°C	23 ± 3	23 ± 3	23 ± 3	23 ± 3
Pressure	hPa	800 ± 30	700 ± 30	600 ± 30	500 ± 30
Time of pressure reduction and pressure increase	min	$\leqslant 15$			
Period of conditioning	h	$\geqslant 1$ *)			
State of operation		2	2	2	2

*) With thermally active specimens after the steady-state temperature of the specimen has been reached.

4.2 Conditioning method 46: combined low pressure and dry heat

See table 2.

Table 2 — Degrees of severity for conditioning method 46: Combined low pressure and dry heat

Degree of severity		01	02	03	04	05	06	07	08	09	10	11	12
Temperature of test chamber	°C	40 ± 3	40 ± 3	55 ± 3	55 ± 3	63 ± 3	63 ± 3	85 ± 3$^{*)}$	85 ± 3$^{*)}$	40 ± 3	55 ± 3	63 ± 3	85 ± 3$^{1)}$
Pressure	hPa	100 ± 5								10 ± 1			
Time of pressure reduction and pressure increase	min	≤ 15								≤ 80			
Mean temperature change during heating/cooling	K/min	0,2 to 2											
Exposure time	h	24	72	24	72	24	72	24	72	24	24	24	24
State of operation		1 or 2											

$^{*)}$ State of operation 1 only.

5 Procedure

The test shall be performed according to the directions given in the relevant specifications and in accordance with ISO 9022-1.

6 Environmental test code

The environmental test code shall be as defined in ISO 9022-1, giving a reference to ISO 9022 and the codes for the conditioning method chosen, the degree of severity and the state of operation.

EXAMPLE

The environmental test of optical instruments for resistance to combined low pressure and ambient temperature, conditioning method 45, degree of severity 02 and state of operation 2 is identified as:

Environmental test ISO 9022-45-02-2

7 Specification

The relevant specification shall contain the following details:

a) environmental test code;

b) number of specimens;

c) location and number of temperature measuring points;

d) preconditioning;

e) type and scope of initial test;

f) state of operation 2: period of operation;

g) state of operation 2: method and extent of intermediate test;

h) recovery;

i) type and scope of final test;

j) criteria for evaluation;

k) type and scope of test report.

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